

Antiaccess / Area-Denial: Old Concepts, New Frontiers

A Monograph

by

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Abstract

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Antiaccess / area-denial (A2AD) tactics are elements of warfare with long histories of use. Understanding the magnitude of the modern A2AD threat requires knowledge of the evolution of A2AD effects. Since WWII, a modern concept of A2AD has evolved along lines of speed, range, and lethality. Case studies of the Maginot Line in WWII, the 1973 Israeli-Egyptian October War, and a hypothetical conflict involving modern-day China and the United States illustrate the evolution of A2AD actions and show the impact of A2AD effects on the overall character of campaigns. Concepts of operational reach, intelligence, and battlespace are critical to informing A2AD and counter-A2AD approaches. Although A2AD is not a revolution in military affairs, it does inform the expected evolution of warfare's character: where feasible, conventional warfare will include A2AD approaches. Without a deeper shared understanding of the A2AD concept, the military faces significant difficulty overcoming the threat it poses.

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Acronyms

A2AD	Antiaccess / Area-denial
AAA	Anti-aircraft Artillery
ASCM	Anti Ship Cruise Missile
C4I	Command, Control, Communication, Computers, and Intelligence
CNA	Computer Network Attack
IAF	Israeli Air Force
IDF	Israeli Defense Force
ISR	Intelligence, Surveillance, and Reconnaissance
JOAC	Joint Operational Access Concept
LOO	Line of Operation
LOE	Line of Effort
MaRV	Maneuverable Reentry Vehicle
JOPP	Joint Operational Planning Process
PLA	People's Liberation Army
PLAN	People's Liberation Army Navy
PRC	People's Republic of China
RPG	Rocket Propelled Grenade
SAM	Surface to Air Missile
UNEF	United Nations Emergency Force

Introduction

Nations and their militaries tend to take advantage of times of peace to consider what the warfare of the future will look like. When they do go to war, the combatants find that the character of warfare they face has similarities and differences with the theorized method of future war.¹ In much the same way that security dilemmas arise, the vision of future warfare drives technological research and development and establishes operational planning constraints and restraints. When conflict breaks out, one fights with the military one has and not with the military one wants. However, a reasonably accurate vision of required future military capabilities can reduce the difference between theory and reality when the next war begins.²

Advanced missile and radar technology have led to significant interest in two particular warfare tactics, termed *anti access* and *area denial*.³ The US military combines these terms into the form antiaccess / area-denial, creating the common military acronym A2AD. Unfortunately,

¹ John A. Lynn, *Battle: A History of Combat and Culture* (Boulder, CO: Westview Press, 2003), 267.

² Deputy Secretary of Defense Paul Wolfowitz gave a modern example of this military truism in an August 2001 press briefing. Prior to the concept of A2AD's insertion into written official defense planning guidance, he described one of the US military's transformational goals as the creation of capabilities necessary to project and sustain US forces in distant anti-access or area denial environments. He described these capabilities as critical future defense needs due to the proliferation of sophisticated missile and targeting technology. In part through its evolution into the joint Air-Sea Battle concept, this idea has driven much of the subsequent decade's Navy-Air Force fire control integration efforts. Jacob Kipp, "Military Reform and the Red Army, 1918-1941: Bolsheviks, Voyenspetsy, and Young Commanders," in *The Challenge of Change: Military Institutions and New Realities, 1918-1941*, ed. Harold R. Winton and David R. Mets (Lincoln: University of Nebraska Press, 2000); Paul Wolfowitz, "Deputy Secretary Wolfowitz Briefing on the Defense Planning Guidance," press release, August 16, 2001, accessed December 2, 2014 <http://www.defense.gov/Transcripts/Transcript.aspx?TranscriptID=1578>.

³ In order to ensure uniformity of syntax throughout this document and align with terms that have formal definitions in official military publications, the terms antiaccess and area-denial are used from this point forward for anti access and area denial respectively. The reason for newfound interest in A2AD is dramatic improvement in missile capability at reasonable cost, combined with relatively easy access to missile weaponry via proliferation channels. Department of Defense, *Joint Operational Access Concept (JOAC)* (Washington, DC: Government Printing Office, 2012), 9, 31.

as a measure of the poor understanding of these concepts across the Army, Navy, Air Force, and Marine Corps, neither joint nor individual service doctrinal dictionaries define either term.⁴ Only in 2012, after over a decade of use in policy circles, was a formal military definition for both terms established via publication of the Joint Operational Access Concept (JOAC)—a policy document approved by the Chairman of the Joint Chiefs of Staff that describes a vision of joint force response against A2AD challenges. Without deeper shared understanding of the A2AD concept, the military faces significant difficulty overcoming the threat it poses. Given the lack of common understanding when referring to A2AD phenomena and lack of inclusion in more widely read doctrine, it is worth reviewing the base doctrinal terms that help force the modern definitions of antiaccess and area-denial.

Antiaccess derives from the joint doctrinal term access. An intelligence collection-oriented term, the *Department of Defense Dictionary of Military and Associated Terms* (Joint Publication 1-02) lays the seed necessary to broaden the concept of access, defining it as “a way or means of approach to identify a target” and the “ability to approach an individual, facility, or information that enables [the] target to carry out the intended mission.”⁵ To gain access, one requires the ability to approach within an exploitable proximity. Access is about getting close

⁴ The current versions of joint and service-specific dictionaries of military terms are: Joint Publication (JP) 1-02, the *Department of Defense Dictionary of Military and Associated Terms*, published 08 November 2010 and amended through 15 March 2014; Army Doctrine Reference Publication (ADRP) 1-02, *Operational Terms and Military Symbols*, published August 2012; Air Force Doctrine Document (AFDD) 1-02, the *Air Force Supplement to the Department of Defense Dictionary of Military and Associated Terms*, published 11 January 2007 and amended through 9 January 2012; Navy Tactical Reference Publication (NTRP) 1-02, the *Navy Supplement to the Department of Defense Dictionary of Military and Associated Terms*, published September 2014; and Marine Corps Doctrine Publication (MCDP) 1-0, *Marine Corps Operations*, published 09 August 2011.

⁵ Originally defined in Joint and National Intelligence Support to Military Operations (JP 2-01.2), the doctrinal definition of access is incorporated into the *Department of Defense Dictionary of Military and Associated Terms*. Joint Publication (JP) 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington, DC: Government Printing Office, 2010), 1.

enough to something to take action against it. With its military antonym thus defined, a concept of antiaccess must include the capability to prevent approach.

As early as February 2002, then Deputy Secretary of Defense Paul Wolfowitz used the term antiaccess in its modern form, describing it as “the efforts of those who want to keep us out of their operating areas.”⁶ Written in military rather than civilian terminology, a 2003 white paper by the Center for Strategic and Budgetary Assessments defined antiaccess tactics as actions that inhibit military movement into a theater of operations.⁷ The 2012 publication of the JOAC bounded antiaccess in terms of distance and created the first formal definition of antiaccess, defining it as “those capabilities, usually long range, designed to prevent an advancing enemy from entering an operational area.”⁸ This document uses the JOAC definition of antiaccess for the purpose of its analysis, focusing more its anti-approach effects than its defined range of preferred employment.⁹

One can find the most likely origin of area-denial in the Army doctrinal concept of area defense. When conducting an area defense, Army units “[deny] enemy forces access to designated terrain for a specific time rather than destroying the enemy outright.”¹⁰ Area-denial

⁶Between August 2001 and February 2002, the terms antiaccess and area-denial lacked succinct definitions. During its nascent stage as a defined concept of warfare, the terms antiaccess and area-denial grouped together described a concept of operations. Senate Appropriations Committee – Defense, *Prepared Testimony on the FY2003 Defense Budget Request to the SAC-D*, February 27, 2002.

⁷Andrew Krepinevich, Barry Watts, and Robert Work, *Meeting the Anti-Access and Area-Denial Challenge* (Washington, DC: Center for Strategic and Budgetary Assessments, 2003). ii.

⁸ JOAC, 40.

⁹ Although long-range missiles are a dominant factor in current A2AD discussion, ignoring the preferred range of employment allows easier application of antiaccess concepts in domains – such as cyber – where range has little importance.

¹⁰ Army Doctrine Reference Publication (ADRP) 1-02, *Operational Terms and Military Symbols* (Washington, DC: Government Printing Office, 2012), 1-2.

broadens this concept of area defense, focusing not on defense of terrain for a specified time, but on opposing enemy freedom of action in general. Actions designed to prevent maneuver—one aspect of freedom of action—provide an area-denial example. When one restricts maneuver, one reduces the flow of force in and through an area in both tempo and density, reducing an adversary's freedom of action. Maneuver enables one's capacity to wage physical war through indirect methods such as envelopment and encirclement. Without maneuver, physical warfare on an operational level is still possible, but simplifies to efforts of direct battle and attrition, phenomena that greatly favor the actor possessing a prepared defense.¹¹ Based on this logic, area-denial thus refers to "actions and capabilities, usually of shorter range, designed not to keep an opposing force out, but to limit its freedom of action within the operational area."¹² The author focuses on area-denial's anti-freedom-of-access aspect rather than distance of employment in follow-on analysis.¹³

Background

A2AD tactics are elements of warfare with long histories of use. Methodologies to deny freedom of access and freedom of maneuver have existed at least as long as maneuver has played a key role in warfare's character. In land warfare, Napoleon established maneuver's dominance during the early nineteenth century.¹⁴ In order to win decisive battles, Napoleon developed a

¹¹ James J. Schneider, *Vulcan's Anvil: The American Civil War and the Foundation of the Operational Art* (Fort Leavenworth, KS: U.S. Army Command and General Staff College, 2004), 31.

¹² JOAC, 6.

¹³ This is not to say that a weapon's physical range of effect is not important in A2AD concepts. Humans live in the physical domains; the physical domains are where much of our combat power lies, and where we must ultimately dominate in order to defeat an enemy. Minimizing the range aspect of antiaccess and area-denial eases employment of these concepts across all physical and non-physical domains.

¹⁴ Although numerous factors enabled the creation of multiple corps of forces in the field, each exercising distributed maneuver, the Napoleonic concept that maneuver and battle were part of the same evolution gave birth to the era of maneuver warfare and signaled (for a time) the end

standardized, three-phase battle plan.¹⁵ The first phase of Napoleonic-era battles of maneuver hinged on area denial. After initial contact, Napoleon's forces attacked to fix the enemy, attempting to deny his adversary freedom of action to retreat from the field of battle.¹⁶ Once fixed with the area denial maneuver, the next two phases involved enveloping the adversary army and then attempting to defeat it in detail.

Warfare at sea did not need a Napoleonic character in mariner garb to bring concepts of antiaccess and area-denial to the maritime domain. According to Julian Corbett – a twentieth-century British naval historian and one of the most influential naval strategists of all time – the object of naval warfare is to directly or indirectly secure command of the sea, or prevent one's enemy from securing it.¹⁷ With undisputed command of the sea, one has freedom of action along maritime lines of communication while simultaneously denying one's adversary access to those same lines. In August 1798, the British fleet under Admiral Nelson smashed Napoleon's fleet in the Mediterranean, securing British command of the sea. Napoleon's forces in Egypt subsequently lost freedom of action on land because of their reliance on sea lines of

of wars of position. David G. Chandler, *The Campaigns of Napoleon* (New York: MacMillan, 1966), 178; Robert M. Epstein, "Patterns of Change and Continuity in Nineteenth-Century Warfare," *Journal of Military History* 56 (July 1992): 375.

¹⁵ Chandler, *The Campaigns of Napoleon*, 187.

¹⁶ An Army tactical mission task, fixing is a highly restrictive form of area-denial. More than attempting to restrict maneuver, fixing an enemy "prevents the enemy from moving any part of his force from a specific location for a specific period." ADRP 1-02, 1-16.

¹⁷ Strategic deployment of naval forces at sea involves continual tension in the concentration of force: one must cover the widest possible area while preserving the cohesion necessary to coalesce rapidly on any point in the area under control. Covering the widest possible area maximizes command of the sea. Cohesion allows the naval commander to mass at the decisive point in both time and space. According to Corbett, "concentration, in fact, implies a continual conflict between *cohesion* and *reach*, and for practical purposes it is the right adjustment of those two tensions—ever shifting in force—which constitutes the greater part of practical strategy." Emphasis added. Julian S. Corbett, *Principles of Maritime Strategy* (Mineola, NY: Dover Publications, 2004), 87, 128-35.

communication for supply.¹⁸ Ultimately, British naval actions – enabled by command of the sea – forced Napoleon to abandon his exploits in the Middle East.¹⁹ In mid-1799, Napoleon returned to France, leaving the bulk of his army in Egypt to wither away.²⁰

According to Corbett, the means of securing command of the sea are by battle and blockade.²¹ Battle is the method of restricting adversary freedom of action in the maritime domain—fighting, or running from fighting, prevents the enemy from doing other things that he may want to do. Blockade is the method of denying access to the domain altogether, keeping adversary ships in port or away from the theater of operations. Command of the sea is by its nature an A2AD problem. In large part, A2AD in the AirSea Battle concept deals with the issues of gaining and maintaining command of the sea in the face of modern military technology. The United States seeks to avoid becoming a Napoleon in Egypt, beaten by an adversary's Nelson.

Maneuver remains central to American doctrinal methods of waging conventional war, with freedom of action and freedom of maneuver serving as underlying critical capabilities necessary to conduct warfare. A2AD operations focus on neutralizing these critical capabilities. Experts expect peer and near-peer competitors to rely increasingly on A2AD tactics as asymmetric methodologies to both deter conflict and neutralize America's conventional competitive advantage.²² Unfortunately, the level of peacetime discourse on A2AD warfare warns

¹⁸ Juan Cole, *Napoleon's Egypt: Invading the Middle East* (New York, NY: Palgrave MacMillan, 2007), 233-34, 42.

¹⁹ David G. Chandler, *Dictionary of the Napoleonic Wars* (New York, NY: Simon and Schuster, 1979), 317; J. Holland Rose, "Napoleon and Sea Power," *Cambridge Historical Journal* 1, no. 2 (1924): 144.

²⁰ Rose, "Napoleon and Sea Power," 244.

²¹ Corbett, *Principles of Maritime Strategy*, 168.

²² Roger Cliff et al., *Entering the Dragon's Lair: Chinese Antiaccess Strategies and Their Implications for the United States* (Santa Monica, CA: RAND Corporation, 2007), iii.

that it will be a central part of the next large, conventional conflict, imparting a significant challenge to maneuver-centric warfare.²³

A2AD assets and their employment will significantly affect the character of a campaign in future conflicts. In conventional campaigns against near-peer and peer competitors, the United States cannot assume it will enjoy relatively unopposed deployment into the theater of operations, forward bases from which to mass expeditionary force, broad and persistent air superiority, and communications networks that ensure unity of effort between dispersed forces in theater.²⁴ A credible A2AD threat also severely curtails military-centered pre-conflict shaping and deterrence efforts in an area of operation. Against A2AD threats, leadership must weigh the higher probability of losing those forces when conflict breaks out against their continuing influence in theater. Removing forces from a potential theater of operations early will preserve their combat power, but negate their ability to shape and deter.

The US military needs new, direct methods to combat modern A2AD threats. The military understands this need and invests in counter A2AD technologies. However, it must also understand that the character of A2AD tactics has changed fundamentally since the United States last faced a peer or near-peer competitor. Modern military planners must fully realize the magnitude of modern, cross-domain A2AD threats. A narrow focus on creating better counter-A2AD tactics designed to defeat modern A2AD threats is not sufficient due to the significant range, speed, and lethality of modern A2AD technology. If planners of military campaigns do not place a primacy of effort on managing the effects of antiaccess and area-denial tactics as part of a campaign's concept of operations, the United State is at risk of not achieving its strategic and

²³Secretary of Defense, *Quadrennial Defense Review* (Washington, DC: Government Printing Office, 2014), x.

²⁴ Sam J. Tangredi, *Anti-Access Warfare: Countering A2/AD Strategies* (Annapolis, MD: Naval Institute Press, 2013), 65-69.

operational objectives or goals against adversaries employing modern A2AD effects. Efforts to neutralize A2AD threats via a campaign approach need at least as much investment as technological A2AD counters. Through analysis of A2AD approaches in past conflicts, one gains insight on how to counter modern A2AD threats at the campaign planning stage.

Methodology

Logic of Argumentation

Three case studies illustrate the evolution of A2AD phenomena and show the impact of A2AD effects on the overall character of a campaign. These case studies include the French Maginot Line defense in World War II and German efforts to circumvent it, Egyptian employment of integrated air defense systems during the 1973 Arab-Israeli War, and a hypothetical case study involving conflict between adversaries possessing modern A2AD effects. The Maginot Line case illustrates the allure of A2AD effects for actors unable or unwilling to match the conventional might of an adversary. The Maginot Line case also serves as an example of the relative ineffectiveness of A2AD methods in an operational approach that lacks sufficient theater-level effects in time, space, and force. Taking place more than three decades after the rise and fall of the Maginot Line, the Arab-Israeli War of 1973 reveals the similarities and differences of A2AD methods in the missile age. Analysis of the hypothetical case study—characterized by A2AD phenomena with significant effects in time, space, and force—places the A2AD threat in modern context in order to assess the relative importance of A2AD tactics against other warfighting efforts in the overall concept of operations against future, near-peer competitors.

Each case analysis includes a background of the campaign and a narrative of the factors that combine to influence the A2AD combatant's overall concept of operations and create the need for A2AD efforts as part of the broader military campaign. A detailed description of the A2AD-related aspects of each case facilitates assessment of the influence of A2AD methods employed by the combatants on the cases' key events and outcomes.

Case Study Evaluation Criteria and Key Factors

JP 1-02 defines the tactical level as “the level of war at which battles and engagements are planned and executed to achieve military objectives assigned to tactical units or task forces.”²⁵

A2AD methods are, at their base level, tactics. A2AD weapons conduct a specific mission and achieve a specific direct objective – they deny an adversary access to and/or freedom of action in a domain. However, technology has evolved A2AD tactics such that their employment in time, space, and force extends well beyond Napoleonic-era efforts to restrict the freedom of action of enemy troops in contact.

Understanding the magnitude of the modern A2AD threat requires knowledge of the evolution of A2AD effects. Breaking A2AD effects down into elements of time, space, and force allows quantification of those capabilities in terms of speed, range, and lethality, respectively. Regardless of its form on the battlefield, describing A2AD tactics in terms of these three elements allows equivalent comparison across all cases. As speed, range, and lethality increase during the eras between each case, when a country anticipates conflict with a superior foe, one expects to find increased A2AD influence on each subsequent campaign’s overall approach to warfare.

The difference between an overall campaign approach and an A2AD approach lies in the specificity of the objective rather than the specifics of any tactical action. Many factors develop a campaign’s operational approach—a description of the broad actions a force must take to achieve the desired end state—and its concept of operations, the statement that concisely expresses what the commander intends to accomplish and how it will be done using the resources available.²⁶ Modern design methodologies such as the Joint Operational Planning Process (JOPP) and service-specific planning methodologies remain germane to developing A2AD approaches.²⁷

²⁵ JP 1-02, 257.

²⁶ Joint Publication (JP) 5-0, *Joint Operation Planning* (Washington, DC: Government Printing Office, 2011), III-5; JP 1-02, 51, 194.

²⁷ Chapter IV of JP 5-0 describes the Joint Operational Planning Process. For more

Like all military campaigns, A2AD campaigns are complex problems.²⁸ One expects to see all elements of operational design and operational art, as well as all possible methods to exploit the operational environment considered to some extent in A2AD campaigns. However, for A2AD approaches designed to restrict freedom of action to move both into and inside of a theater of operations, some concepts of war and warfare planning stand out in importance.

The concepts of operational reach, intelligence, and battlespace are critical to informing successful A2AD approaches.²⁹ Operational reach—the distance and duration across which a joint force can successfully employ military capabilities—in A2AD approaches has expanded exponentially, as new technology has evolved A2AD efforts from employment of force across a front to employment of force across multiple domains.³⁰ Without appropriate operational reach, an adversary will pierce or ignore the protective umbrella created by an A2AD effort. Unless reinforced with adequate intelligence capabilities, A2AD approaches risk ineffectiveness due to

information on each individual service's operational planning methodology, see: Joint Publication (JP) 3-30, *Command and Control of Joint Air Operations* (Washington, DC: Government Printing Office, 2014), Army Doctrine Reference Publication (ADRP) 3-0, *Unified Land Operations* (Washington, DC: Government Printing Office, 2012), Marine Corp Warfighting Publication (MCWP) 5-1, *Marine Corp Planning Process* (Washington, DC: Government Printing Office, 2010), and Navy Warfare Publication (NWP) 5-01, *Navy Planning* (Washington, DC: Government Printing Office, 2013).

²⁸ Complex problems are issues that cannot be answered through simple, logical procedures. They generally require abstract, critical thinking, and viewing through multiple frames of reference in order to arrive at a solution. The now-superseded (although still acquirable) TRADOC Pamphlet 525-5-500, *Commander's Appreciation and Campaign Design*, provides a good explanation why modern campaigns are complex problems. TRADOC Pamphlet 525-5-500, *Commander's Appreciation and Campaign Design (CACD)* (Washington, DC: Government Printing Office, 2008), 8-12.

²⁹ "Battlespace" is the span of domains through which A2AD tactical actions are able to operate. In casual conversation, operational environment can convey the same meaning as battlespace. However, Joint doctrine in JP 1-02 describes the operational environment as a composite of the conditions, circumstances, and influences that affect the employment of capabilities. Effectively, the operational environment is the scenario-specific complex system in which one operates. Rather than risk a reductionist and therefore muddled employment of the term operational environment, the term battlespace conceptualizes the range of places where adversaries can do battle.

³⁰ JP 5-0, III-33.

adversary surprise or deception operations.³¹ Increasingly, the effectiveness of one's intelligence capability enables the effectiveness of the offensive weaponry employed in an A2AD approach.

Operating in the necessary battlespace is tightly linked with operational reach, and vital to successful A2AD approaches. Geographical battlespace will always remain important to planners of A2AD operations—land is the only physical space where it is practical for humans to live. However, as technology expands A2AD operational reach, A2AD approaches seek success by increasingly operating across multiple physical—and non-physical—domains. Sam Tangredi, in his book *Anti-Access Warfare*, theorizes that militaries adopt A2AD approaches because they have limited resources and expect to fight against a strategically superior enemy.³² Applying Tangredi's logic in reverse, if one can devise ways of stripping away an adversary's A2AD effectiveness without confronting the generating activity directly, one can expect an unfair fight against a weak enemy.

Synthesis of evolving A2AD effects through time is the key to understanding their influence on the future character of warfare. At the conclusion of each case, a synthesis section analyzes the impact of A2AD planning and execution on the conduct of the overall campaign. When possible, analysis links the failure or success of A2AD efforts directly to the failure or success of the campaign. Once case analysis is complete, the conclusion synthesizes the relative improvement of A2AD phenomena over time/space/force between each campaign, showing the

³¹ Compared to other defensive approaches, A2AD's effectiveness as a defensive approach relies more heavily on intelligence as an element of combat power than protection. Few if any of the tactical operations in a modern A2AD campaign can be conducted without strong information collection capabilities. Defensive approaches in the past have largely focused on leveraging a superior position, creating favorable conditions for attrition scenarios. A2AD defensive approaches do not seek to trade blows with an opponent from a position of strength or even to trade space for time. Modern A2AD approaches seek to minimize the need for these types of defensive approaches by keeping the adversary's military out of the operational area entirely. Successful surprise and deception activities may yield greater results against modern A2AD approaches than against historical A2AD approaches. ADRP 3-0, 2-6, 3-1, 3-4; Tangredi, *Anti-Access Warfare*, 101-02.

³²Tangredi, *Anti-Access Warfare*, 60.

link between specific tactical A2AD improvements and the increasing necessity of A2AD and counter-A2AD considerations in future military campaigns.

Case Studies

The Maginot Line

Romantically dubbed the “Shield of France,” the Maginot Line included eighty-seven miles of fortified defenses along the Franco-German border and another 250 miles of lesser-fortified areas along the Belgium and Luxembourg frontiers.³³ The fortifications get their name from André Maginot, a veteran of WWI and later French Minister of War who pushed the program through Parliament and presided over the Line’s initial construction work. At a time when the majority of France did not want to acknowledge the possibility of another war, Maginot surveyed the post-WWI political, social, and physical scars of France and pushed the nation down a course where the defensive became the best—and of necessity, the only—option.³⁴

Constraints on a Devastated Population and Land

Fear provided the interwar impetus necessary to begin preparations for a future conflict. French leaders feared the Treaty of Versailles might prove too weak to prevent Germany from again rising to menace France. Ferdinand Foch, the Marshal General of France who accepted Germany’s WWI request for an armistice, refused to sign the Treaty of Versailles stating, “This is not peace. It is an armistice for twenty years.” Through the Treaty, France received lesser-than-desired war reparations. Greater concessions would have balanced—in French eyes—the traditional mismatch in economic power between the two states. France also believed it needed

³³ Alistair Horne, *To Lose A Battle: France 1940* (Great Britain: Macmillan, 1969), 62.

³⁴ Vivian Rowe, *The Great Wall of France: The Triumph of the Maginot Line* (Great Britain: Putnam and Company, 1959), 48; J. E. Kaufmann and H. W. Kaufmann, *Fortress France: The Maginot Line and French Defenses in World War II* (Westport, CT: Praeger Security International, 2006), 15.

permanent control of the Rhine, to preclude forever its use as a German staging ground for assaults on France.³⁵ Falling far short of a permanent annexation, France instead gained only temporary occupation of Germany's Rhineland up to the left bank of the Rhine.³⁶ Without these economic and territorial concessions, France could once again face a strategically superior force attacking from favorable terrain.

France could not afford another economic disaster like WWI on its own soil. Without the Rhineland as a permanent buffer, France needed to find other methods to protect itself against Germany. WWI devastated almost seven percent of France's territory, including some of its most industrial and agriculturally productive areas. Trench warfare, artillery, and bombs ravaged over 12,500 square miles of fertile soil, severely affecting French agricultural production. War damage decreased coal and steel production by twenty-seven and sixty percent respectively. Thirty-five hundred miles of rail and 30,000 miles of road ceased to exist.³⁷ Overall, the French Ministry of Finance estimated the material damage caused by the Germans to be 134 billion gold francs, or more than 384 billion US dollars in 2014 terms.³⁸ Desire to protect "sacred" French soil against an enemy still seen as strategically superior bent French interwar efforts towards defensive efforts designed to prevent future war on French territory.³⁹

If France's economy could ill afford another war like WWI, her population could afford it less. French casualties in WWI numbered 1,315,000—or twenty-seven percent of all men between the ages of eighteen and twenty-seven.⁴⁰ Only Serbia could claim a higher mortality rate.

³⁵ Horne, *To Lose A Battle*, 51-52; Anthony Kemp, *The Maginot Line: Myth and Reality* (New York: Stein and Day, 1982), 21-22.

³⁶ Kaufmann and Kaufmann, *Fortress France*, 9.

³⁷ Horne, *To Lose A Battle*, 46.

³⁸ Nineteen-Eighteen Franc-to-Dollar conversion is five-and-a-half francs to the dollar. Dollar inflation adjustment from 1918 to 2014 is per the United States bureau of labor statistics.

³⁹ Horne, *To Lose A Battle*, 58.

⁴⁰ *Ibid.*, 37.

Including the wounded and missing, seventy-three percent of French manpower mobilized between 1914 and 1918 returned disabled in some way, shape, or form. With so many young men removed from the cycle of life, France's population of forty million could look forward to almost a generation of static population growth.⁴¹ Unless afforded decades to recover, another war with proportional population losses near that of WWI would finish France as a nation. Of necessity, France required an approach that protected its population from the lethality of modern war.

French military and civilian leaders who advocated offense as the best defense in a future conflict were largely nonexistent. Pre-WWI French military instructions claimed morale as the supreme factor in battle. Against the type of warfare waged by the German machine, morale-centric efforts resulted in massive losses of manpower and material early in the conflict. Huge casualty lists revealed the need for more than just audacity and courage. By the end of WWI, French military thought had firmly changed. Instead of audacity, firepower became the method of killing enemy troops. Tactical methods emphasized controlled, methodical battles in order to save troops and material. French officers used casualty data from WWI to show that casualties in a strongly conducted defense were approximately fifty percent less than operations where troops maintained the offensive.⁴² Reinforcing the need to protect French troops and land, military approaches involving methodical, firepower-intensive defense inhabited the French zeitgeist throughout the interwar period.

The French Concept of Effective Defense

During the interwar period, France constructed a military operational approach around its centers of gravity: French population and French land. A belief in the strategic superiority of the defense gave rise to the Maginot Line. With it, French soil would remain unspoiled as a future

⁴¹ Kemp, *The Maginot Line*, 13.

⁴² Robert Allan Doughty, *The Seeds of Disaster: The Development of French Army Doctrine 1919-1939* (Hamden, CT: Archon Books, 1985), 70-76.

enemy dashed itself to death on rocks of overlapping fortifications. French military leadership envisioned methods to protect and leverage its reduced population using the power of the defense.⁴³ Arranged properly, France's eastern defenses would also safeguard its soldiers for the near future; a string of years during which manpower would be at its lowest.⁴⁴

As originally envisioned, the Maginot Line's designers planned it to defend along three of the four traditional eastern invasion routes onto French soil. The fourth route, along France's border with Belgium, does not support robust fortifications like the three routes along Franco-German border. The flat, open plains that characterize France and Belgium's northern border lie close to sea level. Any attempt to create a system of fortifications integrated by underground tunnels would result in flooded works.⁴⁵ The lack of natural obstacles on the plains meant that fortifications would have to be much more extensive—and expensive—to offer the same protection as works along the other fronts.⁴⁶ Fortunately, the Franco-Belgian alliance created an opportunity for France to turn this defensive weakness into an operational strength.

With a strong defensive front along the Franco-German border, hostile action from the east would most likely occur along the path of least resistance—in Belgium—allowing France to fight with its ally forward of its borders and thus avoid the scourge of war on its own soil once again. Unfortunately, hedging this opportunity with a fortified French line along their shared border would also place Belgium outside of France's physical security barrier. With so visible a monument to French unwillingness to protect its ally to the end, Belgium would have great incentive to return to its pre-WWI neutral stance between France and Germany and rely upon German morals to keep it out of another Great Power conflict.⁴⁷ Seemingly secure in its alliances

⁴³ Ibid., 54-55; Kaufmann and Kaufmann, *Fortress France*, 4.

⁴⁴ Rowe, *The Great Wall of France*, 48.

⁴⁵ Kemp, *The Maginot Line*, 18-23.

⁴⁶ Doughty, *The Seeds of Disaster*, 59.

⁴⁷ Unfortunately for France, Belgium eventually declared neutrality anyway, depriving

and confident in its operational approach, France set out to build an impenetrable area-denial weapon along its eastern borders.

The Maginot Line in Time, Space, and Force

For eighty-seven miles, the Maginot Line dominated the pre-WWII landscape along the Franco-German border and defended the major avenues of attack from Germany into France.⁴⁸ Based on a concept of overlapping defense in depth, the Line's purpose was to engage in direct combat against enemy forces attempting to breach the Line, and hurl them backwards.⁴⁹ Designed to defeat any possible German ground attack, the Maginot Line possessed impressive depth for its day. Near the frontier, small outposts served to delay any attacks and sound the alert, nullifying any surprise attack attempts. Around two miles behind the outposts, advance-post concrete fortifications sporting armament of up to 65-mm naval guns provided the serious resistance necessary to give the main defensive *ouvrages*—or fortresses—time to fully man their defenses. Although never fully completed along the Line, behind the fortresses, a rear line of smaller blockhouses served to contain any possible breakthrough. Throughout the defensive area wove anti-tank barriers, anti-tank ditches, and mined crossroads. In general, the Line's defenses stretched four to six miles deep, extending up to twelve miles in some cases.⁵⁰

Specialized as artillery and infantry works, the *ouvrages* possessed the necessary firepower to defeat all anticipated possible combination of German forces thrown against them. Nested in retractable turrets, infantry weapons included dual drum-fed machine guns, 50-mm mortars, anti-tank guns, and heavy machine guns. Artillery predominantly consisted of 75-mm

France of forward defense options as well as the time necessary to build the Maginot Line across the Franco-Belgian border. Horne, *To Lose A Battle*, 63.

⁴⁸ Rowe, *The Great Wall of France*, 62.

⁴⁹ Kaufmann and Kaufmann, *Fortress France*, 34.

⁵⁰ *Ibid.*, 26; Horne, *To Lose A Battle*, 62-65.

cannon, 81-mm mortars, and 135-mm heavy mortars. Fed by mechanized ammunition delivery systems delivered from underground magazines, troops had little fear of running out of ammunition. Designed to resist 420-mm weapons—the largest caliber of German artillery in WWI—foot-thick steel turrets and eleven-foot thick reinforced concrete walls and ceilings protected the fortresses’ defenders.⁵¹

Mutually supporting artillery arcs of fire from the fortresses and Interval Troops—infantry troops equipped with field artillery—provided the mobility of force needed to throw back concentrated enemy attempts on any particular point along the Line. Most fortifications could rely on artillery support from at least two other fortresses on the Line. The limited success German troops would achieve against the Maginot Line resulted from situations where these mobility elements were absent. During WWII, German forces overcame Maginot Line Extension fortifications at La Ferté—southeast of Sedan—and fortifications built around the town of Mauberge, along the direct invasion route from Belgium into France. Lesser-armed and armored than main Line works, these fortifications received little effective mutually supporting troops and artillery from nearby defenses, greatly contributing to their defeat against superior odds.⁵² Even with comparatively weak capabilities compared to the main Line, La Ferté held for three days before succumbing to the German onslaught.⁵³

Area Denial Tactical Success and Strategic Failure

The Maginot Line is a classic case of an area denial strategy employed to prevent access into another area. Along its zone of control, the Maginot Line denied German freedom of action to penetrate into France without great cost. Along any section of the three Fortified Regions of

⁵¹ Kaufmann and Kaufmann, *Fortress France*, 35-36, 42-43, 49, 52.

⁵² Rowe, *The Great Wall of France*, 64-65, 76-77; Kaufmann and Kaufmann, *Fortress France*, 85-86, 163-65.

⁵³ Doughty, *The Seeds of Disaster*, 69.

the Line, the defensive makeup of the Line minimized chances of German envelopment and encirclement of any particular fortifications of the Line. With German ability to maneuver around or through the Line negated, the resultant attrition-style warfare greatly favored the impressive defensive works erected by France. Judged by the German decision not to attempt frontal assaults against its main sections, the Maginot Line Fortified Regions were a tactical success.

Locally, the Maginot Line adequately employed operational reach, intelligence, and battlespace to maximize tactical success. The Maginot Line's strong local operational reach—a function of protection, sustainment, and endurance—created its relative impenetrability. In terms of distance, the Line had the appropriate defensive depth to inflict massive casualties against direct German ground attacks onto French soil. The air domain was not a battlespace of concern for the Line, as its designers believed the sky-facing firing ports necessary for anti-aircraft artillery (AAA) might have softened the hard protective shells of the Line's fortifications.⁵⁴ Located underground, galley, ammunition, power, ventilation, and other sustainment functions ensured Line defenders' endurance against prolonged attacks.

Observation turrets and forward outposts provided the intelligence capabilities necessary to negate any surprise attack attempt. Those who built the Line anticipated the heaviest possible artillery the Line might face and designed its defenses to handle the blows. The Line's builders did little to hide the robust defensive walls and firepower incorporated into each of the Line's separate elements. Doing so would have reduced the deterrent value implicit in France's A2AD approach.⁵⁵ Geography supported the Maginot Line's local area denial function. Fortresses incorporated natural cover for protection while orienting along routes that ensured minimal dead ground within their own fields of fire. Terrain around the fortresses supported anti-tank and anti-

⁵⁴ Kaufmann and Kaufmann, *Fortress France*, 44-45.

⁵⁵ Tangredi discusses state employment of A2AD as a deterrence “great wall” strategy, with the intention being to create a sense of security (at once both real and realized by the population) against perceived external threats. Tangredi, *Anti-Access Warfare*, 72, 238.

personnel obstacles. Where possible, defenses incorporated rivers and floodable areas to slow any German advance.

Regardless of its local success incorporating operational reach, intelligence, and geography into effective tactical plans, the Maginot Line did not enable strategic success. The Line's small theater-wide operational reach, French failures in the strategic and operational intelligence arena, and difficulties of geography along the Franco-Belgian border ultimately resulted in inadequate A2AD LOOs necessary to defend France against Germany. With respect to operational reach, the Maginot Line's mortal defect lay not in its depth but its length.⁵⁶ Most of the Line's weaponry had a maximum effective range of slightly over seven miles—excellent for supporting other fortifications, but a horrible power-projection radius for otherwise achieving antiaccess or area-denial.⁵⁷ Its lack of mobility and limited weapons range coupled with the French mindset behind its creation meant a strategic failure of the Maginot Line if its enemies found the freedom of action to go around the fortifications.

The Maginot Line possessed an Achilles heel—one that reflected French ideas about warfare that developed during the interwar years—fixed, defensive positions with limited operational reach in terms of range. However, lack of anticipation and intelligence combined with false assumptions about geography proved its downfall. Revocation of the Franco-Belgian alliance in 1936 shattered the Maginot Line strategy. No longer could France count on a carefully coordinated active defense in Belgium with its Belgian ally. If French planners and political leaders in any way anticipated loss of the Franco-Belgian alliance, the organization of the French army and its war strategy may have been profoundly different. Instead, by the time the alliance dissolved, France was committed to the Maginot Line.

Without the alliance, in the event of war France could not enter Belgium until Germany

⁵⁶ Horne, *To Lose A Battle*, 62.

⁵⁷ Kaufmann and Kaufmann, *Fortress France*, 35-36.

had already invaded.⁵⁸ Unless the French Army could move quickly, battles would be meeting engagements on the Belgian plains—something for which the defensive-minded French Army was ill suited—or once again fought on sacred French soil.⁵⁹ Anticipating the poor outcome of meeting engagements in the Belgian plains, French war planners focused on how to rush troops into defensible positions in Belgian territory once invited by Belgium. In addition to avoiding conflict on French soil, French defensive plans in Belgium involved fronts nearly fifty miles shorter than a defense along the Franco-Belgian border. When Germany commenced operations in May 1940, the French Army rushed into Belgium as planned, leaving its flank and rear exposed to an unanticipated assault.

France failed to anticipate Germany's capability to project massive force through the Ardennes Forest. Already discounted as an avenue of approach by French military experts, Marshal Pétain—then France's Minister of War—dismissed the Ardennes from French military thought when he declared the forest impenetrable to the Senate War Committee.⁶⁰ Geographical intelligence failed to reveal the paths and methods Germany could (and would) use to penetrate through the Forest's dense woods and sparse road network. Even if Germany decided to attack through the forest, France assumed her defenders in the area would have no problem picking the Germans off piecemeal as they emerged from the Ardennes.⁶¹ French intelligence also failed against elaborate German deception schemes aimed at convincing France that the main German effort, when it came, would fall upon the Maginot Line prevented French interval troops along the Line—a large portion of France's infantry reserve—from redeploying elsewhere and shoring

⁵⁸ For an overview of French planning along its anticipated northeastern front, see Doughty, *The Seeds of Disaster*, 65-66. More detailed discussion of French plans along the northeast front are available in Horne, *To Lose A Battle*, 157-65.

⁵⁹ Horne, *To Lose A Battle*, 73.

⁶⁰ Rowe, *The Great Wall of France*, 61.

⁶¹ Ibid.

up weaker defenses.⁶²

Characterized in time, space, and force by short-range static defense, the most significant flaw of the Maginot Line was its lack of operational reach to affect events in Belgium. Against the actual German assault into France, the Maginot Line proved inconsequential. Other phenomena of A2AD strategy played supporting roles in the Line's failure to defend France. Nuances of geography and failure to anticipate extrinsic events like the dissolution of the Franco-Belgian alliance and assaults through areas strong in geographical defense but weak in military defense prevented its extension along the necessary length. Poor French intelligence prevented redeployment of its Interval Troops—the only part of the Line's defenses with significant mobility—to other parts of France's defensive perimeter. Ultimately, the Maginot Line failed as an A2AD strategy because it could not inhibit enemy freedom of action along the necessary front. In order to be an effective shield, an A2AD strategy must cover the area one desires to defend.

October War / Yom Kippur War of 1973

Since 1948, Israel and its neighbors have fought several short, conventional, high-intensity wars. Blending motives of fear, honor, and interest in varying amounts, the rationale for conflict between Israel and participating Arab states differed for each conflict.⁶³ Further complicating the political objective of any particular conflict, Great Power rivalries also used conflict in the Middle East as a proxy for their own ideological struggles. The Soviet Union provided military and economic assistance to Egypt, Syria, and Iraq as a wedge to gain access to the Arab world and counter American interests in the region.⁶⁴ The United States and European

⁶² Horne, *To Lose A Battle*, 197.

⁶³ See Jowett's History of the Peloponnesian War for Thucydides' elaboration of fear, honor, and interest as motives for conflict. Benjamin Jowett, *Thucydides, History of the Peloponnesian War* (Oxford, England: Clarendon Press, 1881), accessed December 2, 2014 <http://data.perseus.org/citations/urn:cts:greekLit:tlg0003.tlg001.perseus-eng2:1.76>. 1.76.

⁶⁴ Charles D. Smith, *Palestine and the Arab-Israeli Conflict: A History with Documents*

powers provided the same assistance to both Arab states and Israel, balancing both sides to advance their own regional interests.⁶⁵ Regardless of the complexity that created the strategic ends desired from the October War of 1973, Egyptian military means to achieve it followed a simpler arc. Lessons learned from the 1967 Arab-Israeli War and new missile technology solidified active defense as the preferred way to achieve Egypt's ends.

Local Constraints and Foreign Enablers

On May 14, 1967, Egyptian troops moved back into the Sinai Peninsula, militarily reoccupying Egyptian territory under the protection of a United Nations Emergency Force (UNEF) since Israel's 1957 withdrawal from the Sinai after the 1956 Suez War. Four days later, Egyptian President Gamal Abdel Nasser demanded UNEF withdrawal from the Sinai, removing the international buffer between Egypt and Israel. On May 21, 1967, Egypt closed the Straits of Tiran to all shipping destined for Israel, an act which—as stated in a speech to the United Nations General Assembly in 1957 by then Israeli Foreign Minister Golda Meir—Israel considered an existential threat and thus just cause for war.⁶⁶

In June 1967, Israel followed through on its statement of almost a decade earlier, defeating the combined militaries of Egypt, Jordan, and Syria over the course of six days. The war began on June 5, 1967 with an Israeli air attack that devastated Arab air forces. Israel attacked nineteen Egyptian air bases, destroying over ninety percent of Egypt's serviceable

(Boston, MA: Bedford/St. Martin's, 2013), 278-79, 311.

⁶⁵ Richie Ovendale, *The Origins of the Arab-Israeli Wars* (New York: Longman, Inc, 1992), 145-49, 64; Smith, *Palestine and the Arab-Israeli Conflict*, 276, 311.

⁶⁶ Paragraph thirteen of Ms. Meir's speech proclaims that interference, by armed force, with ships of Israel flag exercising free and innocent passage in the Gulf of Aqaba and through the Straits of Tiran, will be regarded by Israel as an attack entitling it to exercise its inherent right of self-defense under Article 51 of the United Nations Charter and to take all such measures as are necessary to ensure the free and innocent passages of its ships in the Gulf and in the Straits. Smith, *Palestine and the Arab-Israeli Conflict*, 257-58.

combat aircraft.⁶⁷ By the end of the first day, Israeli Air Forces (IAF) also destroyed the Jordanian Air Force and over two-thirds of the Syrian Air Force, giving Israel complete air superiority over the battlefields.⁶⁸ The next five days saw the complete destruction of Egyptian armored forces in the Sinai by Israeli air and armored forces assisted by infantry.⁶⁹ Leveraging freedom of action in the air and highly mobile armored forces on the ground, Israeli Defense Forces (IDF) overwhelmed the Egyptian military, handing it a decisive defeat.

Between the 1967 Six Day War and the October War of 1973, the Egyptian military conducted a significant study of the Israeli military. It concluded that Israel's greatest advantages were adaptability and maneuver, which in turn generated its strong armored warfare and air combat capabilities.⁷⁰ Egypt determined that its own forces fought poorly in maneuver warfare because it required initiative, improvisation, and flexibility—all of which its junior leadership lacked. Concluding its self-analysis, the Egyptian military decided that many of its problems in past wars were a product of Egyptian culture and thus not changed quickly or easily.⁷¹ Unable to match Israeli maneuver with maneuver of its own, Egypt instead looked to approaches capable of negating Israeli maneuver.

Fortunately for Egypt, the Soviet Union readily stepped in to help mitigate Israel's freedom of action in the air. Prior to their general expulsion in July 1972, upwards of 15,000 Soviet troops were active on Egyptian soil in integrated air defense (IAD) roles, flying planes and operating missile and air defense installations.⁷² Egyptian needs vis-à-vis its conflict with Israel

⁶⁷ Chaim Herzog, *The Arab-Israeli Wars: War and Peace in the Middle East from the War of Independence through Lebanon* (New York: Vintage Books, 1984), 152.

⁶⁸ *Ibid.*, 153.

⁶⁹ *Ibid.*, 163-64.

⁷⁰ Kenneth M. Pollack, *Arabs at War: Military Effectiveness, 1948-1991* (Lincoln, NE: University of Nebraska Press, 2002), 100.

⁷¹ *Ibid.*

⁷² Herzog, *The Arab-Israeli Wars*, 215; Pollack, *Arabs at War*, 106.

aligned with Soviet strategic aims. While expanding its ideological footprint, through Egypt, the Soviet Union moved closer to its goal of controlling the Suez Canal, the main link between the Mediterranean and the Indian Ocean.⁷³ Additionally, Egypt-Israel skirmishes in the air domain during this time provided valuable insight to the Soviet Union and America, testing Soviet and Western equipment against each other in combat. With both sides closely monitoring lessons learned from air conflict between Egypt and Israel, the entire system the Soviet empire relied upon for its air defense received testing in Egypt against Western equipment.⁷⁴ By October 1973, Soviet training and equipment had created an Egyptian-manned IAD system, designed to deny Israeli airborne access to Egyptian soil and neutralize Israeli freedom of action in the skies over the Suez Canal.

The Egyptian Approach – A Scripted Affair

Decisive defeat in the Seven Day War of 1967 shaped the political aims of Egypt's 1973 October War strategy. Rather than win a total war in 1973, Egypt need only win a limited battle to achieve political victory. Sadat aimed to regain Egypt's international and self-respect by shattering the myth of Israeli military invulnerability, creating a new position of strength from whence to continue negotiations for a final, settled peace. If Egypt's military could kill a few thousand Israelis and force the IDF to withdraw, even just a little bit, from its occupied positions in the Sinai, the military would achieve Egypt's political goals.⁷⁵

High Minarets, Egypt's war plan in 1973, sought the desired limited military objectives using an active defense strategy. To compensate for historical Egyptian difficulties in combined

⁷³ Herzog, *The Arab-Israeli Wars*, 215.

⁷⁴ Ibid., 217.

⁷⁵ Derek Hopwood, *Egypt: Politics and Society 1945-1981* (Winchester, MA: Allen & Unwin Inc., 1982), 108; George W. Gawrych, *The 1973 Arab-Israeli War: The Albatross of Decisive Victory* (Fort Leavenworth, KS: Combat Studies Institute Press, 1996), 9; Joseph Finklestone, *Anwar Sadat: Visionary Who Dared* (Portland, OR: Frank Cass, 1996), 90.

arms maneuver and lack of tactical initiative and adaptability, the General Staff scripted the entire operation down to the action of every squad and platoon. Egyptians would cross five to ten miles into the Sinai and then assume a defensive posture within their air defense coverage, forcing Israel to exhaust itself against heavily protected infantry.⁷⁶

Israeli airpower and armor, however, posed significant threats to success. Egyptian generals held no illusions about the Egyptian Air Force's inability to challenge the IAF for control of the skies.⁷⁷ Any attempt to counter armor with armor on the open dunes of the Sinai held similar risk. To ensure the war of attrition occurred on favorable terms, a linchpin of Egypt's military strategy involved efforts to restrict these elements' freedom of access to and freedom of maneuver on the battlefield. To neutralize Israel's superior firepower and maneuver in the form of its tanks and aircraft, the Egyptians deployed enormous numbers of Soviet anti-tank missiles, rocket-propelled grenades (RPGs), mobile AAA, and surface to air missile (SAM) systems.

Egyptian A2AD in Time, Space, and Force

Supporting Egyptian land forces on the Sinai Peninsula, Egyptian A2AD elements enjoyed stunning success early in the campaign. Almost immediately after Egypt's assault across the Suez commenced, Israeli aircraft rushed towards the Canal, hitting Egypt's missile shield head-on. After losing fourteen aircraft and with many others damaged during the first two days of the war, Israel ordered its air force to remain clear of the canal for fear of further losses.⁷⁸ New, Soviet-supplied surface-to-air missile (SAM) technology in the form of SAM-2, SAM-3, and SAM-6 missile batteries, plus man-portable SAM-7 missiles ensured Egyptian A2AD effects possessed the range and lethality needed to defeat otherwise-superior Israeli forces.

⁷⁶ Pollack, *Arabs at War*, 102.

⁷⁷ Gawrych, *The 1973 Arab-Israeli War*, 10.

⁷⁸ Pollack, *Arabs at War*, 112.

At the outbreak of the Yom Kippur War, some fifty SAM batteries lined the western bank of the Suez.⁷⁹ The SAM-2 'Guideline' formed the backbone of Egypt's IAD system. With a maximum range of thirty-one miles, the SAM-2 is capable of hitting aircraft flying as high as fifty-nine thousand feet. Although designed for some degree of mobility, as a complete system the SAM-2 weighs over one hundred tons and is thus limited to relatively smooth and hard-packed terrain.⁸⁰ With a range of just under fourteen miles, the SAM-3 'Goa' missile is a short-range compliment to the SAM-2 and intended primarily for medium altitude targets.⁸¹ With a range of thirty-seven miles, the SAM-6 'Gainful' was the most capable A2AD weapon in the Egyptian arsenal. Its effectiveness at medium altitude often forced Israeli pilots to fly at low altitudes, where they were then engaged AAA fire and man-portable SAMs.⁸² Combined with the longer-range SAM-2 missile, the SAM-3 and SAM-6 created an Egyptian air defense system with few gaps in coverage and the depth necessary to protect Egyptian ground forces. From launch sites in Egypt on the west of the Suez Canal, Egypt's missile systems provided anti-aircraft cover for Egyptian forces up to the planned limit of advance east of the Canal.

Although designed with varying degrees of mobility, with the exception of the SAM-6 systems, most Egyptian air defense batteries were not mobile.⁸³ Missile bases generally consisted of up to four launchers surrounding an earthen mound bunker housing fire-control instrumentation and targeting systems. The SAM-6 added some flexibility to the otherwise

⁷⁹ Herzog, *The Arab-Israeli Wars*, 307.

⁸⁰ Christopher Chant, *Air Defense Systems and Weapons: World AAA and SAM Systems in the 1990s* (McLean, VA: Brassey's Defense Publishers, 1989), 58-60.

⁸¹ Designed for use against low-flying aircraft, the SAM-3 'Goa' missile can be mounted on a mobile platform or launched from underground bunker facilities. Herzog, *The Arab-Israeli Wars*, 215; Chant, *Air Defense Systems and Weapons*, 61-62.

⁸² *Ibid.*, 66.

⁸³ Avraham Adan, *On The Banks of the Suez: An Israeli General's Personal Account of the Yom Kippur War* (New York: Presidio Press, 1980), 319.

immobile Egyptian IAD system. Mounted on a tank chassis, the SAM-6 required only minutes to pack up and move to a different site, preventing the Israelis easily carving corridors through the Egyptian A2AD network.⁸⁴ The other mobile component of the Egyptian IAD system came from the man-portable SAM-7 ‘Grail’ missile. With an altitude limit of just 4,920 feet and a range of slightly over two miles, it added more—albeit short-range—mobile capability to Egypt’s effective A2AD network.⁸⁵

Antiaccess Strategic Success and Eventual Tactical Failure

Egyptian IAD employment in the 1973 October War against Israel is one of the first examples of a missile-based antiaccess approach. Like the Maginot line, Egyptian A2AD efforts in the October War employed a concept of overlapping defense. However, rather than a Maginot-style approach to A2AD focused on restricting adversary maneuver to create an attrition scenario, the Egyptian approach sought to negate elements of Israel’s combat power by denying the IAF access to the air domain. Due to its successes in shooting down Israeli warplanes, Egyptian A2AD efforts created geostrategic success. However, in the context of an enemy operating its forces in a decisive-shaping-sustaining framework, Egypt’s inability to prevent access or conduct area denial against Israeli ground forces led to the eventual tactical failure of Egypt’s A2AD efforts.⁸⁶

⁸⁴ Herzog, *The Arab-Israeli Wars*, 307.

⁸⁵ Chant, *Air Defense Systems and Weapons*, 68-70.

⁸⁶ *Unified Land Operations* discusses in detail the decisive-shaping-sustaining operational framework. Not confined to solely a description of army operations, it articulates a method of visualizing operations in time, space, purpose, and resources. In the case of the Yom Kippur War, Israeli land forces formed the decisive operation, ultimately responsible for removing Egyptian land forces from the Sinai. IAF close air support and interdiction strikes, such as they were, constituted shaping operations designed to support the land forces tasked with directly accomplishing the mission. It is also worth mentioning that the Egyptian decision to attack deeper than the original High Minarets operational plan constituted a severe overreach of Egyptian capability, enabling Israeli land forces to exploit the resultant seams in Egypt’s defense-in-depth strategy. ADRP 3-0, 1-12.

Egyptian A2AD efforts in the air, along with the successful reoccupation of Israeli-held territory east of the Suez Canal formed the two cornerstones of Egyptian strategic success. Operation High Minarets never sought total military victory. After studying Israel's past military efforts, Egyptian military leadership anticipated Israel's future use of tanks and aircraft and designed a campaign to counter them. Successful employment of Egyptian A2AD effects as created by IAD systems, to the extent that they deterred Israeli airborne participation in conflict areas covered by Egypt's IAD umbrella, destroyed the Middle Eastern myth of Israeli military invulnerability.⁸⁷ In the eyes of Anwar Sadat, Egypt's actions in 1973 washed away Arab shame acquired in the 1967 war, as well as balanced US, Soviet, and Israeli power in the Middle East enough to continue negotiations towards a favorable Egyptian-Israeli peace.⁸⁸

Egyptian A2AD efforts in the air domain worked well initially, primarily due to adequate operational reach in terms of time, space, and force. From their positions on the west bank of the Suez, Egyptian missile batteries defended the airspace over the Egyptian ground force's limit of advance.⁸⁹ Organic intelligence collection capability added the timely information element critical to Egypt's effective A2AD operational reach. Missiles with speeds of Mach 1.5 and up sited with target detection and acquisition radars generating targeting information well beyond actual missile range ensured Egypt's IADs provided near-instantaneous threat protection even at their maximum operational ranges.⁹⁰

Aside from possessing the reach necessary to ensure anti-air protection, the Egyptian military possessed enough missiles to ensure its air defenses did not run out of munitions throughout the conflict's duration. This abundance of quantity was important for Egypt's poorly

⁸⁷ Hopwood, *Egypt*, 107.

⁸⁸ Finklestone, *Anwar Sadat*, 137, 41-42.

⁸⁹ Adan, *On The Banks of the Suez*, 344.

⁹⁰ Chant, *Air Defense Systems and Weapons*, 59-60, 66-68.

trained IADs operators. Operators “compensated for their inefficiency by launching masses of SAMs and concentrating entire battalions of AAA]on Israeli aircraft.”⁹¹ Overall, Egyptian forces fired around one thousand SAM-2, SAM-3, and SAM-6 missiles, and between four to eight thousand SAM-7s.⁹² Anticipating the low proficiency of its personnel, Egyptian army leaders employed more SAMs against Israel than the United States then had in its entire inventory.⁹³ Although Egyptian IAD accuracy proved uniformly atrocious, the quantity of missiles fired made up for the relative inaccuracy of any individual missile. Many inbound missiles, each with a small change of causing defeat, are as effective—and often even more effective as a deterrent against future operations—as just one or a few inbound missiles with much high probability-of-kill percentages.⁹⁴

In the October War, the technological character of Egypt’s A2AD assets and the character of the threat they attempted to defeat meant that although geography significantly influenced the limited objectives Egypt sought to achieve, geography played a relatively minor role in the decision to employ an A2AD approach. The largest single Israeli threat to Egypt’s military emanated from the air. Therefore, Egypt’s A2AD approach also focused on the air domain. No geographic features impinged on the operational reach of Egypt’s missiles once clear of their launchers, as the Sinai area of operation in the October War was relatively flat. The relatively long operational reach of individual IAD units and the limited territorial focus of the campaign sufficiently mitigated mobility restrictions imposed by the Sinai’s sandy topography

⁹¹ Pollack, *Arabs at War*, 125.

⁹² Ibid.

⁹³ Ibid., 108.

⁹⁴ Lack of ammunition or the limits of its target-engagement capacity eventually limit military system effectiveness. For this reason, swarms of projectiles have greater aggregate probability overwhelming point-defense systems in time and space than single-munitions systems, increasing the chance of some combat power penetrating an anti-missile defense and reaching its target.

and limited road network.⁹⁵ In a fast-paced, short-range air A2AD environment, with no geographic features to create counter-A2AD corridors or safe havens, particulars of geography are not particularly important.

IADs constituted the bulk of Egyptian A2AD efforts in the form of antiaccess effects. Unfortunately, Egyptian anti-tank weaponry and tactics minimally affected Israeli armor's freedom of maneuver. Initially surprised by Egypt's antitank weaponry, Israel suffered heavy armor losses. However, Egyptian antitank forces did not attempt to maintain the initiative and permanently negate Israel's ground maneuver superiority.⁹⁶ Thus, Egypt's numerically superior ground forces held only for a short time an attrition-oriented position of relative advantage. Israeli ground commanders quickly adapted, countering unvarying Egyptian battle tactics by innovating, such as deploying armored personnel carriers with machine guns fitted on top to suppress Egyptian antitank fire.⁹⁷ Without effective ground area-denial capabilities and lacking accurate intelligence of Israeli forces on the western bank of the Suez necessary to conduct timely protective IAD repositioning, enough Egyptian missile batteries fell to create corridors of Israeli air superiority through Egypt's A2AD umbrella.⁹⁸

Characterized in time, space, and force by medium-range, semi-mobile active defense, the most significant flaw of Egypt's A2AD approach was its lack of operational reach—it did not extend to the ground. Although airpower formed the largest single threat to Egypt's military, airpower was only an Israeli shaping force—land power, led by tanks, formed the decisive force for both sides in the October War. Against tanks, air-domain antiaccess weapons are useless.

⁹⁵ The fact these systems did not move easily across the canal and across the Sinai because they were cumbersome and most effective when hardwired into an integrated network was a reason why Egypt's initially limited objectives were chosen.

⁹⁶ Pollack, *Arabs at War*, 116-17.

⁹⁷ *Ibid.*, 113.

⁹⁸ Herzog, *The Arab-Israeli Wars*, 310.

Against tanks, Egyptian antitank area-denial weaponry and tactics failed to stop Israeli maneuver. As a result of Egyptian anti-tank forces' failure to adapt to changing Israeli ground tactics, Egyptian ground forces on the west bank of the Suez failed to protect Egyptian IAD systems, minimizing those systems' ability to maintain the durational aspect of operational reach. In addition, Egyptian intelligence failed to provide timely data on Israeli ground forces west of the Suez, preventing Egyptian IADs from using mobility as a protective function. By the end of major combat operations, most Egyptian IAD systems were non-operational.⁹⁹ Without ground area-denial component capable of denying Israeli freedom of maneuver inside of weapons engagement range, Egyptian A2AD efforts in the October War enjoyed only short term and limited tactical success. Egypt eventually lost the battle for the Sinai, retreating from the Peninsula after Israeli penetration into its rear areas threatened to collapse the Egyptian Third Army.

US-China in the South China Sea

In 2015, China initiated a conflict with the United States for maritime dominance of the global commons in and around the South China Sea.¹⁰⁰ For a number of reasons, America lost the war and its mantle of leadership in Asia-Pacific. Although this conflict never happened, this hypothetical scenario between the United States and China created by James Kraska brings A2AD strategy between two near-peer competitors into the modern technical age. The scenario is fictitious. However, the national interests and capabilities of the two actors are very real.

The Road to War

In March of 1996, China attempted to influence Taiwan's first presidential election with

⁹⁹ Ibid., 275, 79-80.

¹⁰⁰ James Kraska, "How the United States Lost the Naval War of 2015," *Foreign Policy Research Institute* Winter 2010 (2010).

demonstrations of military force in the Taiwan Straits, conducting military exercises and missile launches for training. The landing zones for those missiles included two locations in the ocean approximately twenty nautical miles away from the major Taiwanese ports of Keelung and Kaohsiung. At the time, over eighty percent of Taiwanese exports flowed through the two ports.¹⁰¹ The United States responded with a visible sign of commitment to stability in the region, moving two Carrier Battle Groups near the Taiwan Straits.¹⁰² Although the incident caused no long-term disruption in diplomatic relations between the United States and China, experts believe it catalyzed China's naval military modernization program.¹⁰³ As of 2015, the People's Liberation Army Navy (PLAN or PLA Navy)—the naval warfare branch of the national armed forces of the People's Republic of China—includes a wide variety of modern platforms and weapons systems.¹⁰⁴

With China's general political and economic rise has come the rise of important economic centers along China's coast. Accordingly, Chinese military strategy has shifted from a people's war of continental defense to maritime power projection and defense of areas on China's periphery.¹⁰⁵ Increased military presence in China's maritime near-abroad and increased competition for sea-based resources is generating potential conflict flashpoints. In close proximity

¹⁰¹ Xinhua, "Smoke Billowing Shock and Awe," CCTV, last modified 1996, accessed January 16, 2015, <http://www.cctv.com/lm/655/32/39507.html>.

¹⁰² The two Battle Groups were the USS Independence (CV 62) Carrier Battle Group and the USS Nimitz (CVN 68) Carrier Battle Group. All told, twelve US warships conducted a show of force around Taiwan.

¹⁰³ Ronald O'Rourke, *China Naval Modernization: Implications for US Navy Capabilities – Background and Issues for Congress* (Washington, DC: Congressional Research Service, 2014), 2.

¹⁰⁴ Ronald O'Rourke's 2014 Congressional Research Service report on Chinese naval modernization contains an excellent summary of modern PLAN platforms, weapons, and capabilities for those interested in the specifics of Chinese naval military hardware. *Ibid.*, 5-37.

¹⁰⁵ Cliff et al., *Entering the Dragon's Lair: Chinese Antiaccess Strategies and Their Implications for the United States*, xiv.

to good fisheries, the Senkaku Islands are located in the East China Sea between China, Japan, and Taiwan. All three states claim ownership of the islands. Fishing vessels and coast guard ships of various states bordering the South China Sea frequently skirmish with each other around contested geographic features like the Spratley Islands and Scarborough Shoals.¹⁰⁶ In the conduct of patrolling the region's sea lines of communication, the United States has also had several incidents with the Chinese military. Potential sparks for US-China conflict have included the April 2001 mid-air collision of a US Navy EP-3 Orion and a Chinese fighter jet, the March 2009 harassment of the USNS Impeccable by Chinese boats, and the December 2013 near-collision of the USS Cowpens and a Chinese naval ship.¹⁰⁷

In addition to direct competition for resources and territory, the actor who guarantees open maritime lines of communication around the South China Sea wields enormous influence. Shipping routes in the South China Sea account for one-third of all seaborne traffic worldwide.¹⁰⁸ Additionally, eighty percent of Chinese, Japanese, South Korean, and Taiwanese oil and gas imports pass through the South China Sea.¹⁰⁹ As the United States' largest source of imports and its second-largest export market, the Asia Pacific region—anchored around the South China Sea—holds significant economic importance for the United States.¹¹⁰

¹⁰⁶ Center for a New American Security, "Flashpoints - Security in the East and South China Seas," last modified 2015, accessed January 24, 2015, <http://www.cnas.org/flashpoints/timeline>

¹⁰⁷ Jane Perlez, "American and Chinese Navy Ships Nearly Collided in South China Sea," *New York Times*, last modified December 14, 2013, accessed January 24, 2015, http://www.nytimes.com/2013/12/15/world/asia/chinese-and-american-ships-nearly-collide-in-south-china-sea.html?_r=0

¹⁰⁸ Robert D. Kaplan, *Asia's Cauldron: the South China Sea and the End of a Stable Pacific* (New York: Random House, 2014), 9.

¹⁰⁹ Alexander L. Vuving, "Vietnam, the US, and Japan in the South China Sea," *The Diplomat*, last modified November 26, 2014, accessed January 24, 2015, <http://thediplomat.com/2014/11/vietnam-the-us-and-japan-in-the-south-china-sea/>

¹¹⁰ Mark E. Manyin et al., *Pivot to the Pacific? The Obama Administration's "Rebalancing" Toward Asia* (Washington, DC: Congressional Research Service, March, 2012),

As it grows to become a regional and global powerhouse, China has two main choices for how to engage with the American-created global system of world order that currently constrains state actors in and around the South China Sea. China can grow and operate with the system, becoming one of the voices among the many—albeit a loud one—attempting to alter the system from within to best suit their desires. Alternatively, China can disrupt the system, displacing the United States as the regional hegemon through direct action. In the scenario presented by Kraska, China picks the second option, destroying a US aircraft carrier and transforming Asian security.¹¹¹

The Chinese Approach – Asymmetric-David Versus Goliath

Resultant from the goal of establishing a force-backstopped hegemony in Asia-Pacific, the high probability of China incorporating an A2AD approach is the "product of the PLA's view of the nature of modern war, its awareness of China's military weaknesses, and its recognition of U.S. military superiority."¹¹² China's naval modernization is now broad-based, including a wide variety of platform- and weapons-acquisition programs, as well as improvements in doctrine, education, training, logistics, and command and control networks. China continues aggressively developing anti-ship cruise and ballistic missiles, land-attack cruise missiles, ships, aircraft, submarines, mines, IADs, and communications networks.¹¹³ However, the Chinese military still lags behind the United States in terms of conventional warfighting capacity and capability.¹¹⁴ Faced with a militarily superior potential adversary, Chinese strategy and technology development focuses on developing asymmetric defeat mechanisms. Experts assess that in any

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¹¹¹ Kraska, "How the United States Lost the Naval War of 2015," 36

¹¹² Cliff et al., *Entering the Dragon's Lair*, xiv.

¹¹³ O'Rourke, *China Naval Modernization*, 3.

¹¹⁴ Cliff et al., *Entering the Dragon's Lair*, xiv.

conflict, China will seek to avoid force-on-force battles and instead strike decisively at adversary weaknesses.¹¹⁵

PLA documents informing a Chinese A2AD approach identify several perceived US military vulnerabilities. The United States military's expeditionary character and persistent global involvement makes it likely that the United States will have few forces near a conflict about to erupt, greatly increasing a belligerent's chance of employing superior force to win the first battle in a campaign. A rapid initial victory creates the time and space necessary to erect a robust A2AD capability. Long logistics chains create additional US vulnerabilities. In Asia-Pacific, the United States is dependent on access to forward basing and support infrastructure to maintain combat power, especially in extended campaigns. The extended nature of American Asia-Pacific supply lines also exposes air and sea supply vehicles to attack for extended periods. Complimentary to efforts aimed at exploiting America's logistical vulnerabilities, China views attacks that deny the United States access to air bases and ports as the most efficient way to gain regional air and maritime superiority.¹¹⁶

Chinese A2AD efforts will likely not be limited to the physical domain. China believes that American command, control, communication, computer, and intelligence (C4I) networks are the most important contributor to US military superiority.¹¹⁷ Chinese writings describe employing kinetic and non-kinetic—most likely cyber and electromagnetic—actions to disrupt and defeat adversary C4I networks.¹¹⁸ In addition to reducing the effectiveness of American combat power, attacks against C4I networks can delay and disrupt US force flow into theater. If they make it past offensive long-range A2AD effects, disrupted—and therefore small and disconnected—force

¹¹⁵ Ibid., 28.

¹¹⁶ Ibid., xv, 46, 49, 62, 67.

¹¹⁷ Ibid., 23.

¹¹⁸ Ibid., 52.

packets are easier to defeat than massed, coordinated combat formations.

Chinese A2AD in Time, Space, and Force

In relation to the United States, the “First Island Chain” forms a key geographical baseline for China’s maritime sphere of influence, and therefore its defensive perimeter. Although not formally defined by Chinese leadership, the First Island Chain generally runs south from Japan, through Taiwan and the western edge of the Philippines, and along the northern edge of Borneo, effectively encompassing the East and South China Seas.¹¹⁹ Singapore and the Straits of Malacca represent the most distant objects in China’s desired near-abroad sphere of influence, roughly twelve hundred miles from the southern-most point of China. However, the vast majority of the East and South China Seas are within eight hundred nautical miles of mainland China. Taking these desired areas of control into account, Chinese A2AD operational reach will more than likely encompass distances of at least eight hundred—and up to twelve hundred—nautical miles in order to deny island-based sanctuary to an adversary.

Chinese A2AD efforts span multiple platforms operating in multiple domains in order to generate antiaccess and area-denial effects. Although not a complete list, the major categories of Chinese A2AD efforts fall under the headings of missiles, submarines, and non-kinetic assets. Each asset category yields both antiaccess and area-denial capability. China’s main A2AD missile inventory includes the *Dong Feng* (DF-21) theater range ballistic missile, various Anti-Ship Cruise Missiles (ASCM), and anti-satellite missiles. Of most concern in the DF-21 series of missiles is the DF-21D variant, a theater-range ballistic missile equipped with a Maneuverable Reentry Vehicle (MaRV).¹²⁰ Frequently touted as the PLAN’s “carrier-killer,” the DF-21D has a

¹¹⁹ Jan Van Tol, *AirSea Battle: A Point-of-Departure Operational Concept* (Center for Strategic and Budgetary Assessments, 2010), 11, 13.

¹²⁰ O'Rourke, *China Naval Modernization*, 5.

range exceeding 810 nautical miles, almost half the distance from mainland China to Guam.¹²¹ If launched from mainland China, this range ensures coverage of the entire East China Sea and roughly eighty percent of the South China Sea – almost encompassing the entire First Island Chain. Although lethality estimates of these missiles are either unknown or classified, experts state that the PLAN's ballistic missile capability is "is clearly the most dramatic emerging threat to US Navy operations in the Western Pacific."¹²²

Expanding upon the anti-access role of missiles—as employed in the October War between Israel and Egypt—Chinese missile functionality adds area-denial effects. China's profusion of ASCMs forms a significant threat to US surface ships on the open ocean. Carried on at least eight of China's submarines, the Russian-made Sizzler (SS-N-27) ASCM has a range of over 156 nautical miles.¹²³ In its terminal homing phase, the missile accelerates to three times the speed of sound, drops to thirty feet above sea level, and has the potential to dodge point-defense systems via high-G maneuvers.¹²⁴ Similar in effect to the DF-21D, US Navy experts explain that the Sizzler may be "the most pertinent and pressing threat the US faces in a Taiwan conflict."¹²⁵ In addition to the DF-21 and the Sizzler, China has or is acquiring nearly a dozen other ASCM variants as well as developing indigenous ASCMs.¹²⁶ Against sea-based threats, China has the ability to engage with significant force across extended space. As China's long-distance, land-

¹²¹ Secretary of Defense, *Annual Report to Congress - Military and Security Developments Involving the People's Republic of China* (Washington, DC: Government Printing Office, 2014), 6.

¹²² Tol, *AirSea Battle*, 42.

¹²³ Global Security, "SS-N-27 Sizzler Specifications," GlobalSecurity.org, last modified January 30, 2014, accessed January 25, 2015, <http://www.globalsecurity.org/military/world/russia/club.htm>

¹²⁴ Tony Capaccio, "Navy Lacks Plan to Defend Against 'Sizzler' Missile," Bloomberg, last modified March 23, 2007, accessed January 25, 2015, <http://www.bloomberg.com/apps/news?pid=newsarchive&sid=a5LkaU0wj714>

¹²⁵ Ibid.

¹²⁶ O'Rourke, *China Naval Modernization*, 7.

based tracking and targeting radar systems—such as over-the-horizon backscatter and over-the-horizon surface wave radars—gain maturity, it will be able to employ these weapons to restrict adversary freedom of action on the high seas in an ever-shortening timeframe.¹²⁷

Submarines are another high-impact platform in China's A2AD arsenal. In addition to the Sizzler missile, Chinese submarines carry various types of active sonar, passive listening, and wake homing torpedoes. Although the range of a torpedo is small—roughly eight nautical miles—versus the range of a cruise missile, a submarine's stealth means that unless firmly determined to be outside of a surface ship's operating area, the threat of a submarine-launched torpedo is ever-present.¹²⁸ In terms of time, space, and force, submarines possess the ability to attrite an adversary's combat power inside China's A2AD umbrella at a time and place of China's choosing. Experts assess that until mitigated, in a combat environment the threat of China's submarines will significantly help keep US high-value surface ships outside of the First Island Chain.¹²⁹

Chinese non-kinetic capabilities present it with highly asymmetric A2AD methods. White papers issued by Chinese military strategists discuss employing non-kinetic methods of denying an adversary access to the space and cyber domains, as well as to the electromagnetic spectrum.¹³⁰ China envisions using electromagnetic pulse weapons to reduce freedom of action in multiple domains via destruction of early warning and detection systems, command systems, and information systems. Without listing specific capabilities, Chinese planners discuss using GPS and radar jamming technology to both deny information to an adversary and weaken it for follow-

¹²⁷ Ibid., 37.

¹²⁸ Cliff et al., *Entering the Dragon's Lair*, 91.

¹²⁹ Tol, *AirSea Battle*, 71.

¹³⁰ Cliff et al., *Entering the Dragon's Lair*, 54, 56; Tol, *AirSea Battle*, 27; Secretary of Defense, "China Military and Security Development 2014," 32.

on kinetic attack.¹³¹ According to one Chinese strategist, as early as 1995 China enjoyed a sixty-five percent success rate hacking into US military computer systems.¹³² China hopes to be so effective as to destroy an adversary's entire unified command and control capability with Computer Network Attacks (CNA).¹³³ Because they aim to exploit unknown vulnerabilities, CNA can happen without warning and presents some of the most asymmetric methods of denying C4I and freedom of action in the physical domains.

A2AD Tactical and Strategic Success: Enabling a Position of Relative Advantage

The China case employs a modern A2AD concept, meaning that it seeks to employ multiple A2AD effects simultaneously across multiple domains to prevent a superior adversary from entering and then operating within the First Island Chain. In conflicts with conventional militaries, the Chinese way of war envisions a high technology, limited war. Short durations, high-tech precision, having only a few, decisive engagements, and having the initiative are critical for Chinese success.¹³⁴ In Kraska's hypothetical US-China conflict, China implements its vision of warfare, avoiding direct conflict except at times and places of its choosing while keeping retaliatory US military forces at bay long enough to achieve a political solution. By leveraging weaponry with extended operational reach, robust intelligence gathering and denial activities, and operating across all domains of the battlespace, China achieves tactical and strategic success.

Modern technology creates significantly more operational reach for China's A2AD approach than in any previous conflict. Theater ballistic and supersonic cruise missiles take only minutes to cross hundreds of miles and reach their destinations. However, distance dominates the

¹³¹ Cliff et al., *Entering the Dragon's Lair*, 76.

¹³² Ibid., 55.

¹³³ Ibid., 54.

¹³⁴ Ibid., 21-23.

tempo of operations by greatly reducing the requirement for precise weapon-launch timing in order to prevent effective counterattack. Chinese missile-launch craft on the air, land, and sea can fire their weapons from outside the engagement zone of United States maritime combatants and up to one thousand nautical miles away from China's coast.¹³⁵ The distance aspect of modern A2AD operational reach also supports A2AD durability. As long as A2AD-related missile inventories and targeting capabilities remain intact, an A2AD approach provides its own physical protection, as safety for an adversary means keeping well outside their own effective weapons range. Until the speed and range of modern offensive weaponry catches up, A2AD's operational reach provides its own physical protection.

Extended operational reach also brings a new A2AD capability to China's theater concept of operations. Chinese military writings discuss attacks on an adversary's sustainment network in order to render existing forces in the region ineffective. Safely outside of the deep- and close-fight operational reach of most American combat power, China intends to employ its A2AD effects to deny America even a rear area of operations in theater. With the ability to hold at risk air bases, ports, supply ships, aircraft, and other elements of America's logistics, transportation, and support network, China intends to use its A2AD operational reach to destroy America's rear area as an important overall part of destroying America's capacity to project military power in the South China Sea.¹³⁶

Facilitating China's near-all-encompassing A2AD reach in the South China Sea, intelligence is perhaps the most critical A2AD-enabling factor. Many Chinese writers believe

¹³⁵ Secretary of Defense, *Annual Report to Congress - Military and Security Developments Involving the People's Republic of China* (Washington, DC: Government Printing Office, 2011), 29; Robert Haddick, "China's Most Dangerous Missile (So Far)," War on the Rocks, last modified July 2, 2014, accessed January 28, 2015, <http://warontherocks.com/2014/07/chinas-most-dangerous-missile-so-far/>

¹³⁶ Cliff et al., *Entering the Dragon's Lair*, 60-71.

intelligence collection, processing, and transmission are vital to a successful A2AD approach.¹³⁷

To enable its A2AD approach, Chinese intelligence, surveillance, and reconnaissance (ISR) efforts are robust and proactive. Chinese ISR aims to find, fix, track, and target the enemy at range in order to facilitate A2AD operational reach. One also expects China's A2AD efforts to need much of the same strategic intelligence regarding American combat deployment preparations required by China's operational planners in order to anticipate any surprise attacks against its A2AD system. Set in the context of modern A2AD activities, the tactical and strategic character of intelligence is blurring.

Characterized in time and force by hypersonic and minimal-warning lethality, Chinese A2AD activities in Kraska's hypothetical case represent the modern, leading edge of A2AD effects. Chinese envisioned A2AD effort in terms of space moves A2AD employment beyond the physical domains. No longer is the A2AD battlespace one of just land, air, and sea. Expect China to restrict freedom of action in, or altogether deny access to, the space and cyber domains as well as the electromagnetic spectrum.¹³⁸ In order to create an effective A2AD campaign, China aims to seize and maintain the initiative in space and cyberspace as well as employ the electromagnetic spectrum in order to dominate the physical domains.¹³⁹ In Kraska's hypothetical scenario, China achieves tactical and strategic success by denying the United States the ability to introduce a local superiority of force at any physical point in China's sphere of influence.¹⁴⁰ Although A2AD effects will still manifest mainly on land, sea, and air, in a South China Sea conflict key A2AD battles will take place outside of the physical battlespace.

Conclusion

¹³⁷ Ibid., 38.

¹³⁸ Ibid., 84-86.

¹³⁹ Ibid., 18, 20, 23, 28-29, 35-38.

¹⁴⁰ Kraska, *How the United States Lost the Naval War of 2015*, 44.

Antiaccess and area-denial concepts in warfare are not new. History shows that they are not recent fads resulting from excessive focus on the Department of Defense's 2012 Joint Operational Access Concept or AirSea Battle concept. However, without a solid understanding of the key factors in A2AD approaches, militaries today face significant A2AD-related risks. New technology used to implement modern A2AD concepts of operation could provide the capability for a military power to make A2AD a "game changer" for those competitors that do not understand what types of conflict it entails.¹⁴¹ Because of the modern speed, lethality, and range of A2AD effects, planners of military campaigns against A2AD-employing adversaries must place a primacy of effort on managing A2AD tactics as part of a campaign's early operations. Otherwise, those campaigns face significant risk of not achieving their strategic and operational objectives against adversaries employing modern A2AD capabilities. Additionally, continued underestimation of the magnitude of modern A2AD's threat to the United States' way of warfare risks eroding the legitimacy of US commitments to allies who already appreciate the threat, and are within weapons range of A2AD-capable adversaries.

Synthesis

The historical analysis presented in this paper traces the evolving character of A2AD in terms of operational reach, employment of intelligence capabilities, and the battlespace in which A2AD conflict occurs. By understanding the underlying character of an A2AD operational approach, planners can create better-informed concepts of operation to defeat A2AD strategies. Knowledge of A2AD's modern active-defense character informs planners of when one can reasonably expect to encounter A2AD efforts in a modern campaign. Knowledge of the broad military lines of operation A2AD actions influence informs planners what campaign elements

¹⁴¹ Andrew S. Erickson and David D. Yang, "On the Verge of a Game-Changer," *US Naval Institute Proceedings* no. 270 (May 2009), accessed February 5, 2015, <http://www.usni.org/magazines/proceedings/2009-05>

need to brace for A2AD effects. Knowledge of the growing primacy of intelligence in A2AD concepts of operation informs planners on what types of activities can most efficiently disrupt modern A2AD tactics.

A New Active-Defense

A2AD is at its root a defensive operational approach to conflict. In terms of area-denial, it seeks to make conflict cost prohibitive—ideally in the form of deterrence, or if that does not work, in terms of actual attrition of blood and treasure—to an aggressor. In terms of antiaccess, it seeks to enable its employer's freedom of action by denying an aggressor access to as much of the theater of operations as possible. The Maginot Line represents an early form of modern A2AD. Possessing immense self-defense capability, but immobile and with short-range weaponry, it lacked the effective operational reach to be more than a purely defensive approach to conflict. Egyptian A2AD in the October War represents the shift of A2AD to an active-defense character. The extended operational reach and limited mobility of Egypt's IADs enabled a defensive barrier that extended beyond Egypt's borders. However, Egyptian A2AD remained limited. Its limited operational reach influenced the limited scope of the broader Egyptian concept of operations, and it proved vulnerable to attack from the land domain.

Represented by actual Chinese technology and a theoretical Chinese approach, the character of modern A2AD has evolved beyond that of its historical predecessors. With a multi-domain, multi-platform approach, modern A2AD regains a prominent characteristic of the Maginot Line—it once again provides its own robust protection against physical attacks. Modern A2AD also retains its recent-history active-defense character, but adds a new, significant capability: The operational reach of modern A2AD is beyond the force projection capability of significant portions of both the employer's and the aggressor's militaries. Throughout history and still today, A2AD is passive, posing no direct military threat until employed. However, modern A2AD is now a powerful first-strike weapon. Possessing significant speed and lethality, an

aggressor can expect small warning before confronting an A2AD attack. Modern A2AD achieves the Clausewitzian ideal of a strategic defense. With first strike capability and robust intelligence capabilities to minimize surprise, an A2AD approach holds the initiative in theater-level combat. Clausewitz wrote, “A sudden powerful transition to the offensive is the greatest moment for the defense.”¹⁴² Unless neutralized, a modern A2AD approach preemptively affords the offensive to the defender.

The Scope of A2AD Effects

Over time, an A2AD approach’s capability to generate effects throughout the areas in a military theater of operation has increased.¹⁴³ The Maginot Line intended to protect against the German decisive effort: ground forces attacking anywhere along a broad front. Egyptian IADs implicitly acknowledged the importance of shaping operations in a campaign. Although land remained the domain of decisive efforts for both Egypt and Israel in the October War, Egypt realized that unless it could neutralize Israeli airborne shaping operations, no amount of effort on land could win the campaign.

Characterized by extended operational reach and multi-domain capability, modern A2AD approaches seek to influence decisive, shaping, and sustaining operations. A2AD weaponry seeks to defeat and destroy platforms (ships, landing craft, aircraft) consisting of or delivering the main effort. Effects on adversary shaping efforts extend beyond anti-air capabilities; A2AD approaches

¹⁴² Carl Von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 370-71.

¹⁴³ The Army’s ADRP 3-0 concept of a decisive-shaping-sustaining framework adds clarity to modern A2AD’s scope of effect. A decisive operation is the operation that directly accomplishes the mission. The decisive operation is the focal point around which commanders design an entire operation. A shaping operation is an operation that establishes conditions for the decisive operation through effects on the enemy, other actors, and the terrain. A sustaining operation is an operation at any echelon that enables the decisive operation or shaping operation by generating and maintaining combat power. Sustaining operations typically address important sustainment and protection actions essential to the success of decisive and shaping operations. ADRP 3-0, 1-12.

also seek to neutralize intelligence gathering and command and control capabilities within their radius of influence. Increased speed, range, and lethality of A2AD activities have finally made sustaining operations vulnerable to A2AD effects. Because of A2AD's long operational reach, adversary forward bases and the lines of communication between them and front-line troops are viable targets. With modern A2AD, threats against sustaining operations are no longer the sole purview of maritime planners focused on enemy submarines. Lines of communication across air, land, and sea are at risk of disruption, defeat, and destruction.

Proactive Intelligence

Intelligence has always been an important aspect of an A2AD operational approach. However, its function has evolved over time. A2AD intelligence supported the Maginot Line in a reactive function. It focused on intelligence collection on the Line itself. If the enemy attacked the outer perimeter of the line, intelligence-oriented functions served to alert the rest of the elements of the Line in order to employ defense-in-depth capabilities. In the October War, intelligence was both proactive and reactive. Egypt's long-range SAMs linked to fire control systems generating targeting information well beyond missile engagement range. When aircraft encountered the edge of Egypt's A2AD umbrella, a missile-centric greeting was a distinct possibility. However, Egypt had no illusions of regarding the porosity of its A2AD umbrella. The four to eight thousand short-range, man-portable SAM-7 missiles launched during the campaign attests to Egypt's understanding of the need for reactionary A2AD effects.

Modern A2AD, couched in terms of Chinese operational capability, retains A2AD's historically reactive intelligence-oriented characteristics. If an adversary attacks within the aegis of modern A2AD employment, expect the A2AD employer to limit the freedom of action of the attacker and attempt its destruction. Yet modern A2AD is also significantly proactive. Beyond physical targeting of combat platforms and support infrastructure, A2AD-oriented intelligence efforts seek to understand—and subsequently exploit—the communications, command, and control

links that enable its adversary to function as a coherent fighting force. Against an adversary employing an A2AD approach, planners must expect disruption and the need for branches in their campaign efforts well before the military makes physical contact with the enemy.

Implications

Historical analysis shows that A2AD is a long-practiced defensive strategy—belligerents would prefer to minimize their adversaries’ freedom of action to attack. Now however, technological progress has expanded A2AD operational reach across both distance and domains, increasing the ability of an adversary to contest entry into a theater. As Clausewitz states, the “aggressor is always peace-loving (as Bonaparte always claimed to be); he would prefer to take over [a] country unopposed.”¹⁴⁴ Expect both offensive and defensive oriented militaries to employ A2AD effects in future conflicts.

Attempts to solve the complex problem of antiaccess and area-denial are beyond the scope and classification of this document. However, by analyzing the historical evolution of A2AD, one can make some educated conjectures about its future impact in warfare. Although A2AD is not a revolution in military affairs, it does inform the expected evolution of conventional warfare’s character: where feasible, conventional warfare will include A2AD approaches.

The United States must expect that challenges to sustaining its operational reach will be the new normal in warfare. American combat forces have always expected the possibility of conflict in theater when they maneuver to within the enemy’s force projection radius. The scope of modern A2AD activities means that the adversaries will now contest the ability to deploy into theater and sustain forces from distant bases.

In the immediate future, the United States must consider the question of how to defeat an

¹⁴⁴ Clausewitz, *On War*, 370.

enemy who possesses highly lethal, longer-range weapons. The cost of “rolling back” an A2AD-minded enemy may exceed America’s threshold of blood and treasure if the objective is limited. To minimize its costs in terms of combat losses, America should focus on methods of creating corridors and pockets of domain control in order to neutralize an adversary’s A2AD activities and effects. In an A2AD environment, rather than seeking broad land, air, and maritime superiority, one should seek to create defined bubbles of superiority in time and space that remain centered on the military force seeking to achieve its objective.

Finally, while not explicitly elaborated on during the case studies, it is worth noting the impact of A2AD on international relations. Due its operational reach, potential lethality, and the proactive, weakness-probing character of its intelligence-gathering efforts, the importance of A2AD as a deterrent to war is higher today than in history. However, the deterrence aspect of A2AD campaigns invites others to design ways to defeat and neutralize its effects. The United States military is placing an increasing amount of intellectual effort on countering the threat of A2AD, as evidenced by documents such as the JOAC and the AirSea Battle concept. Where intellectual rigor goes, capital and technology development follows, creating a spiral of increasing military capability. A2AD is the new deterrence security dilemma. Expect its prominence to grow in future military intellectual discussions, doctrine development, and military-industrial importance.

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